

eastward, cold northwesterly winds prevailed to the northward of Alabama, while in the southern portion of the East Gulf States warm southerly winds obtained, showing a contrast in temperature of from 15° to 20°.

## VERIFICATIONS.

*Indications.*—The detailed comparison of the tri-daily indications for March, with the telegraphic reports for the succeeding twenty-four hours, shows the general percentage of verifications to be 85.3 per cent. The percentages for the four elements are: Weather, 86.7; Direction of the Wind, 82.7; Temperature, 87.4; Barometer, 84.5 per cent. By geographical districts they are: for New England, 86.2; Middle States, 88.7; South Atlantic States, 89.5; Eastern Gulf States, 86.4; Western Gulf States, 86.6; Lower Lake region, 84.7; Upper Lake region, 78.4; Tennessee and the Ohio valley, 86.3; Upper Mississippi valley, 81.7; Lower Missouri valley, 84.8; Northern Pacific coast region, 90.9; Central Pacific coast region, 86.5; Southern Pacific coast region, 94.6. There were 124 omissions to predict (55 being due to the absence of reports from the Pacific coast) out of 3,813 or 3.36 per cent. Of the 3,689 predictions that have been made, 165, or 4.47 per cent, are considered to have entirely failed; 130, or 3.53 per cent, were one fourth verified; 369, or 10.00 per cent, were one-half verified; 361, or 9.78 per cent, were three-fourths verified; 2,664, or 72.22 per cent, were fully verified, so far as can be ascertained from the tri-daily reports.

*Cautionary Signals.*—218 Cautionary Signals were displayed during the month, of which 199, or 91.3 per cent, were fully justified by winds of 25 miles per hour or over at, or within a radius of 100 miles of, the station. 130 Off-shore Signals were displayed, of which 99, or 76.2 per cent, were fully justified; 121, or 93.1 per cent, justified as to direction; 104, or 80.0 per cent, justified as to velocity, and 4, or 3.1 per cent, completely failed. 90 of the Off-Shore and 2 of the "Northwest" Signals were changed from Cautionary. Six "Northwest" Signals displayed on the Lakes were fully justified. 354 Signals of all kinds were displayed, of which 304, or 85.9 per cent, were fully justified. The above does not include signals ordered at display stations where the velocity is only estimated. 71 winds, of 25 miles or over, were reported, for which no signals were ordered. Fourteen signals were ordered late.

## NAVIGATION.

*Stage of Water in Rivers.*—In the table on the right-hand side of chart No. III are given the highest and lowest stages of water, as observed on the Signal Service river-gauges, during the month of March, 1881. The principal rivers draining the Eastern Rocky Mountain Slope and those falling into the Atlantic and Gulf of Mexico from the South Atlantic and Eastern Gulf States have been subjected to high, rapid and dangerous rises during the month. The Red and Arkansas rivers reached their highest stages between the 1st and 7th, the former approaching within two feet of the danger-line. The Missouri, from Yankton to Leavenworth, reached its maximum stage between the 26th and 29th, reaching the danger-line at Omaha on the 27th. The Mississippi from La Crosse to St. Louis, reached its highest stage between the 26th and 31st; from Cairo to Memphis, between the 1st and 3rd, at the former station rising to 11 inches above the danger-line, and at the latter station to within 17 inches of it; from Vicksburg to New Orleans, between the 8th and 17th, rising 10 inches above the danger-line at the former station and to within four inches of it at the latter. In the Ohio, Cumberland, Monongahela and Tennessee rivers the highest stage was reached between the 20th and 26th. At Augusta on the Savannah, the water on the 18th rose to 32 feet, 4 inches, the highest point since 1865. The Williamette at Portland, Or., reached its maximum stage on the 3rd.

*Ice in Rivers and Harbors.*—The following items, relative to the formation or continuation of ice in such bodies of water throughout the northern sections of the country, exhibit the same for the month of March, 1881. The Missouri has broken up throughout nearly the whole of its course, as well as most of its tributaries, but the Mississippi at St. Paul and northward, still remains frozen. At all lake stations the ice has broken up and moved out, leaving navigation open and boats in many instances have been running regular trips. *Tongue River.*—Fort Keogh, 2nd, ice broke up and passed out; but little damage done. Miles City, 2nd, ice broke up and gorged at a point two miles above the city; water rose rapidly, flooding the streets to a depth of three feet; people left their houses in boats or whatever else would serve to float them; men were seen building boats and sawing and splitting wood on the house-tops. In several instances gorges were blown up with powder and dynamite; one gorge formed having a length of seven miles; damage to property very severe. *Yellowstone River.*—Ft. Keogh, 2nd, ice broke up and passed out causing no damage. Miles City, 2nd, river clear of ice, but water very high. *Little Missouri River.*—Deadwood, 25th, ice broke up during the night and passed out causing no damage. *Big Cheyenne River.*—Deadwood, 25th, ice broke during the afternoon; river gorged at several places. *Big Horn River.*—Ft. Custer, 2nd, ice broke up and passed out during the day. *Des Moines River.*—Ottumwa, 29th, ice gorge broke, filling the river with large quantities of heavy ice, which passed down the stream with resistless fury, carrying everything before it; wagon bridge, consisting of five iron spans, was destroyed entailing a loss of from \$8,000 to \$10,000; considerable damage to merchandise and warehouses along the banks of the river, and several

cellars flooded along Main street. Eddyville, 29th, gorge broke during the afternoon, damaging considerable property, water flooded some of the principal streets to a depth of four feet. Buena Vista, 26th, heaviest ice-gorge ever seen at this point; broke up during the evening, when the water fell 10 feet; railroad bridge seriously injured. Red Rock, 29th, ice gorging very heavily, causing the water to flood everything in vicinity; 30th gorge passed out. *Platte River*.—North Bend, 25th, ice breaking up and forming heavy gorges along the river for miles. *Loup River*.—Columbus, 26th, large quantities of heavy floating ice passed into the Platte, destroying an immense amount of property along the river. *North Fork River*.—Duncan, 25th, ice broke up and passed down into the Platte, carrying away telegraph poles and all property along the banks. *Maquoketa River*.—Logan, Ia., 14th, river free of ice. *Wapispinicon River*.—Independence, Ia., 29th, ice passed out causing no damage; ice on mill pond 34 inches thick and still firm. *Republican River*.—Clay Centre, Kan., 3rd, ice broke up at 3 p. m., carrying away six bridges at various points along the stream. *Rock River*.—Beloit, Wis., 31st, river open by gradual melting and wearing away of the ice. *Mississippi River*.—Moline, Ill., 31st, ice broke up during the morning and piled in huge mountains along the shore to the height of from 18 to 40 feet; the Keokuk Northern Line dock and warehouse valued at \$4,000 was entirely demolished, and the Diamond Jo freight house together with several cars destroyed; Warsaw, 29th, gorge passed out this morning; river clear between here and Keokuk. Keokuk, 16th, ice forced up by rapidly rising water, portion of gauge carried away; 20th, river breaking up in places; 21st, gorge breaking up; 22nd, river rising, ice moving out slowly, all clear around gauge; 23rd, ice gorging and breaking up; 24th, 3.50 p. m., ice moving slowly; 6 p. m., gorged opposite lower part of city; 25th, 10 a. m., moving slowly; 4 p. m., carried away a portion of draw-bridge; 26th, 2.15 p. m., channel clear opposite main part of city, but still gorged near the lower portion; 27th, main channel filled with floating ice at intervals, Illinois side closed; 28th, gorge at Pattersons' Dyke and the ice along the Illinois side broke up and moved through a slough above Tow Head Island, Illinois side now open, but river still closed and ice gorged across Tow Head Island; 29th, last gorge broke at 5 p. m., river now entirely open, channel, filled at intervals with floating ice; 30th, navigation open, steamer "Josie," (first boat of season,) departed for St. Louis, heavy floating ice in channel; 31st, steamer "Arkansas," from St. Louis, first arrival, light flow of ice in channel. Davenport, 31st, ice broke up in the Rapids, gorging between the Water Works and government bridge, water rising to within three feet of the highest point reached last summer, ice two to three feet thick. Old steam boat men state that this is the first time they ever saw the river solid from Davenport, the foot of the Rapids, to Le Claire, the head of the Rapids, hardly a single air-hole was visible the whole distance of 18 miles, even the channels through the "Chains" (Moline chain, Campbell's chain, Sycamore chain, &c.,) which have never been frozen over before in their memory, were solid with ice. The present ice gorge is reported to have been the most destructive since that of the 10th of March, 1868, which was the worst ever known along this portion of the Mississippi River. Burlington, 28th, ice in river moving slowly in large fields; 29th, ice breaking up and slowly passing down without any material damage; 30th, river nearly free of ice; 31st, light flow of ice, navigation would be resumed but for a gorge still intact a few miles below the city. La Crosse, 26th, ice breaking up in the Mississippi; Black River now open near its mouth; 27th, river observations resumed, ice broken away from gauge; considerable floating ice in channel. St. Louis, 1st, gorge-ice running down from the Illinois River, which is breaking up very rapidly; 2nd, river full of large fields of heavy ice from broken gorges in the Illinois and Missouri rivers; 3rd and 4th, light ice on the Illinois side; 5th, river clear; 6th, light ice; 7th, clear; 9th and 10th, light ice on the Illinois side; 11th, river clear; 14th, light drift-wood and ice; 15th, full of heavy gorge-ice, mingled with drift-wood; 28th, ice and drift-wood; 29th, clear. Clinton, Ia., 31st, ice in river 24 to 26 inches thick and perfectly solid; water 10 feet 7 inches above low-water mark, having risen to that point within the last four days. This rise has broken the ice loose from the shore, but it remains immovable. *Missouri River*.—Yankton, 29th, ice breaking up and forming huge gorges; 30th, gorges broke during the evening causing a loss of about \$100,000, principally to railroad and steamboat property. The town of Green Island, opposite Yankton, entirely swept away, every building being broken up or floated off by the ice. All steamers moored along the river above Yankton are seriously damaged, and those near by are total wrecks. Signal Service Observer at Yankton reports afternoon of the 29th, gorge 8 miles long, water rising with great rapidity, great loss in horses and cattle. Sioux City, Ia., 30th, water rising rapidly, ice breaking up; 31st, ice gorged from this point westward to Springfield, Dakota, a distance of about 70 miles. Vermillion, Dakota, 31st, huge gorge extending up and down the river for miles; ferry-boat a total loss; much other damage to property. Bismarek, 29th, ice broke up during night; 30th, gorged for miles below the city, at many points forming a solid mass of ice reaching to the bed of the river; great loss to railroad property. The power of huge ice-cakes that forced their way through the woods is shown by the fact that cottonwood trees two feet in diameter were easily cut down by them. Ft. Lincoln, Dak., 30th, ice-gorge immovable, water rising rapidly; all buildings opposite the Fort carried away; several persons rescued from blocks of ice, many cases of indescribable suffering. Ft. Pierre, Dak., 31st, ice terribly gorged, water rising rapidly; great loss of stock and other property,

much suffering among the people. Mandan, Dak., 31st, ice six feet deep all over the town and very solidly packed; no one can reach a point within three miles of the city because of the huge belt of broken ice surrounding it. Omaha, 26th, river gorged near the U. P. R. R. bridge; 27th, gorge broke and ice passed out without any serious damage; the Missouri now open at this point. Ft. Benton, 4th, river opened about 1 p. m., water rose above banks, carrying with it immense cakes of ice; people obliged to leave their houses for places of safety. Iowa City, 31st, ice breaking up and forming heavy gorges, causing much damage to railroad and other property. Leavenworth, 11th, river gorged; 12th, no signs of breaking up; 13th, broke up and moved down about a half-mile; 14th, gorge moved out rapidly, carrying away the river-gauge; 15th and 16th, river full of floating ice; 26th and 27th, full of heavy ice, occasionally gorging; 28th, river clear; 29th and 30th, heavy floating ice; 31st, river clear. Ft. Yates, Dak., 27th, ice broke up at 2 p. m. and passed out rapidly. Council Bluffs, 27th, ice broke up during the morning; 28th, gorged in several places, river rising rapidly. Corning, Mo., 23rd, ice broke up at 3 p. m.; 24th, gorged at several points, water rapidly rising. Oregon, Mo., 15th, ice breaking and moving out; no damage reported. *Maumee River*.—Toledo, 11th, ice-gorge breaking up; 14th, ice slowly running out; 16th, river and harbor partly open, allowing tugboats to run freely between the grain elevators. *Grand River*.—Lansing, Mich., 28th, ice broke up and began to move out; no damage reported. *Black River*.—Port Huron, 19th, ice breaking up; 20th, river open, ferry-boats made regular trips. *St. Clair River*.—Port Huron, 23rd, navigation open to St. Clair, first boat arrived from Marine City; 24th, heavy floating ice; 25th, ice bridge at Point Edwards broke away; 26th, large fields of ice floating down; 27th, light flow of ice; 28th, gorged at head of river; 29th, gorge partially broken; 30th, gorge passed out, river nearly clear; 31st, river clear. *Detroit River*.—Detroit, 20th, river clear of ice; 30th, floating ice in considerable quantities; 31st, river clear. *Lake Erie*.—Buffalo, 31st, except a short, narrow opening, the ice in lake outside of breakwater is still solid as far as the eye can reach. Cleveland, 18th, first arrival of boat on the Ohio Canal; Canal nearly free of ice; 19th, ice in lake broken up by heavy southeasterly winds; mouth of Cuyahoga River open, though along the lake shore the ice is still solid; 24th, schooner "Selkirk" left for Kelly Island, first departure of the season; tug "Myrtle" arrived from Sandusky, first arrival by lake; 30th, an immense field of ice moving toward the city and as far as the eye can reach it appears to be one solid, unbroken mass; 31st, lake covered with ice as far as can be seen, harbor completely closed. Sandusky, 8th, ice in bay rotting; 13th, ice moving slowly; 15th, ice broke into large fields and moved a short distance from docks; tug "Myrtle" arrived from Cleveland, first of season; 16th, ice near docks again solid; 19th, bay clear of ice, being driven out by heavy winds; first time clear since November 20th, 1880; 24th, tug "Myrtle" left for Cleveland, first departure of season; 25th, tug "C. L. Johnson" arrived from Cleveland; 29th, bay full of floating ice; 30th, high winds filled the bay again with ice, which has frozen solid, steamer R. B. Hayes fast in ice, had to be cut out. Toledo, 24th, lake clear of ice, tug-boats running freely about in the harbor. *Lake Ontario*.—Oswego, 30th, schooner "Marcia" sailed for Toronto, first vessel out on the lake, very rough weather experienced, with considerable ice; 31st, large fields of floating ice in lake. Rochester, 26th, lake navigation considered to be practically resumed. *Niagara River*, Buffalo, 21st, ice broke up, tug-boats passed through; 24th, river partially clear; 27th, river entirely clear. *Long Island Sound*.—New London, 1st, ice banked up along the shore, filling the slips along the docks and seriously impeding navigation; 28th, thin ice formed in slips, harbor full of shipping since the 26th. Flushing, 4th, navigation open, propeller "Lloyd" forced her way through the ice; 5th, heavy floating ice; 6th, clear of ice; 25th, 26th, thin ice formed; 27th, entirely open. *Penobscot River*.—Bangor, 11th, ice breaking up and moving out, gorging in the afternoon; 12th, 13th, ice moving gradually in large fields; 15th, ice moving towards mouth of river; 18th, river free of ice, navigation resumed; 26th, 28th, thin ice formed during the night. The following list shows the dates of closing and opening of navigation at the port of Bangor for the past ten years: Opened, 1871, March 13th; 1872, April 19th; 1873, April 19th; 1874, April 16th; 1875, April 16th; 1876, April 18th; 1877, March 23th; 1878, April 2nd; 1879, April 24th; 1880, April 6th; 1881, March 18th. Closed: 1871, November 30th; 1872, December 10th; 1873, December 1st; 1874, December 12th; 1875, November 29th; 1876, December 10th; 1877, December 30th; 1878, December 19th; 1879, December 19th; 1880, November 26th; 1881, November 26th. *Contoocook River*.—Contoocookville, N. H., 20th, ice breaking up and passing down without damage. *Pine River*.—Wellsboro, Pa., 20th, ice broke up and passed out, no damage reported. *Lake Champlain*.—Charlotte, 31st, ice breaking up and moving slowly. *Hudson River*.—Albany 11th, ice opposite lower part of city moved about 200 feet, opening channel between Albany and Greenbush, enabling ferry to resume regular trips; 16th, navigation resumed to-day, river free of ice, tug "C. S. Maury" arrived from Troy; 17th, first tow of loaded canal boats left to-day; 19th, ice gorge between Stayvesant and lower Kinderhook Light, broke up during the night, river now open to New York City; 21st, tow-boat Ontario arrived from New York city with 40 loaded canal boats, first of season. Poughkeepsie, 10th, river now open from Albany to New York city. Ardenia, N. Y., 11th, ice broke up and passed out, no damage reported.

*Floods*.—The month of March has been a memorable one along the region bordering the Missouri river in Montana, Dakota and Nebraska, where the heaviest and most destructive floods,

(due to the sudden and general breaking up of the ice,) for many years, have occurred. In Nebraska, the valleys of the Platte and Loup rivers have suffered loss of property almost without precedent. In Kansas, the central and western portions of the State have been subjected to considerable loss of property. In Alabama and Georgia, from the operation of a different cause, viz: heavy rains, much damage has been inflicted. *Alabama*.—Selma, 24th, river highest since 1865, surrounding country under water, great damage to property. Tuscaloosa, 25th, Black Warrior river rose 63 feet, causing great destruction of property along its course. Finches, 21st, Black Warrior river highest ever seen here, water nearly a foot deep in the warehouses. Greensboro', 24th, highest water for several years, streets flooded, much loss to agricultural property. Demopolis, 24th, river highest ever seen, surrounding country partially under water, considerable destruction to property. Gainesville, 24th, Tombigby river above its banks; rose 10 feet during the night, city partially flooded; people leaving their houses and suffering great loss in household property. Centreville, 24th, Catawba river overflowed, much damage to property in the country, bridges, fences and buildings washed away. Eufala, 24th, Chattahoochee river overflowed, all boats laid up and business suspended, several bridges carried away, all bottom lands flooded. Montgomery, 21st Alabama river highest for 15 years, heavy washouts along the various railroad lines, bridges and telegraph poles carried away; in the city the damage has been considerable, on the west side of Court street leading out by the Alabama warehouses, several houses were completely surrounded by water, reaching nearly to the second-story windows; people in this vicinity passed from place to place in boats or upon floating planks; the depth of water in the main channel of the river was variously estimated from 75 to 90 feet. Tensas, 31st, Tensas river overflowed; the Mobile and Montgomery railroad track for a distance of three miles washed away, much other damage to railroad property; all transfers of freight now made by boat from Mobile to Tensas bridge, delaying traffic very seriously. *Dakota*.—Bismarck, 30th, Missouri river overflowed, water on the bottom lands several feet deep, many buildings washed away, together with large quantities of hay and other property, 40 head of cattle drowned, several lives lost and many narrow escapes; steamboat property and government warehouses suffered severely. Yankton, 29th, Signal Service observer reports, morning of the 29th, river rose five feet in past 10 hours, country 40 miles to the eastward, overflowed to a depth of three feet and a width of two miles, railroads submerged, all roads impassable. *Florida*.—Houston, 17th to 21st, heaviest rains for years, surrounding country flooded, Suwannee river highest for past 40 years, corn rotting in the ground, crops generally suffering because of excessive moisture. *Georgia*.—Augusta, 17th, very heavy rains, streams rising rapidly; 18th, river highest since 1865, upper portion of city submerged. The City of Hamburg, S. C., partially inundated. *Kansas*.—Seward, 18th, West Blue river overflowed, submerging the country for a distance of several miles; wagon-bridge at Beaver Crossing carried away; considerable damage to other property. Stockton, 19th, Big Creek overflowed; several bridges carried away; horses and cattle drowned; heaviest flood since 1867. Rome, 18th, town completely submerged; buildings and bridges washed away. Hays, 19th, country for miles about, covered with water; considerable property destroyed. *Nebraska*.—North Bend, 27th, Platte river overflowed, submerging the country for a distance of 15 miles on either side; two miles of railroad track swept away; bridges, telegraph-poles, workshops and all buildings and fences in the vicinity of the river destroyed; the town flooded to a depth of several feet, compelling the inhabitants to take flight for safety; all communication of every kind cut off. Columbus, 27th, Loup river inundated the whole lower portion of city; damage to private property immense; wagon-bridge, valued at \$50,000, carried away; railroad-bridge on the Black Hills road destroyed; several lives lost. The Platte valley, for a length of about 100 miles, subjected to the most disastrous flood ever experienced in the history of the State; houses, barns, fences, bridges and stock have been carried away in large numbers, entailing a loss estimated at over \$500,000. Benton, 27th, entire surrounding country covered with water to a depth of several feet; buildings, bridges and fences swept away; cattle have been drowned in large numbers and several human lives lost; over half the bridges in this section of the State destroyed and numerous grist mills washed away. Columbia, 27th, a large body of water several miles in width, formed, surrounding the town, driving the people from their homes and compelling them to pass about in boats or upon floating pieces of timber; destruction to property immense. St. Paul, Howard Co., 27th, surrounding country flooded; all country bridges swept away; railroad bridge on the St. Paul branch of the Union Pacific Railroad washed out. Oreopolis, 27th, the Burlington and Missouri Railroad bridge, over the Platte river, washed away; all telegraph lines down and country submerged for miles. Clarksville, 27th, all bottom lands flooded and several miles of the Union Pacific Railroad tracks washed away. Lincoln, 27th, city completely flooded by the overflow of Salt Creek; people floating about in boats or upon pieces of timber; portion of city deserted. North Platte, 12th, heavy washouts on the Union Pacific Railroad; trains delayed and abandoned. Dunca, 27th, surrounding country flooded to a depth of several feet; people compelled to flee from their houses for places of safety; highest and most destructive flood that ever visited this section of the State. Fremont, 26th, whole city flooded to a depth of several feet; considerable damage to household property and merchandise; Union Pacific Railroad suffered great loss from washing away of tracks, culverts and other property. Schuyler, 27th, town submerged to a depth of ten feet; all houses deserted; people placed themselves and personal effects into freight-

cars, preparatory to deserting the city; many were compelled to cling to the debris of buildings for safety until rescued. Genoa, 27th, town flooded to a depth in many places of 13 feet; river filled with dead cattle, hogs and horses, the debris of bridges, buildings, farm-machinery and lumber; several houses completely covered with water on the bottom lands south of the town. *New York*.—Rochester, 20th, Genesee river overflowed; considerable damage to buildings near the Lower Falls; all the bottom lands for several miles under water. *Maryland*.—Baltimore, 9th, very heavy rain, flooding a portion of city, causing considerable damage to property; serious land-slides on B. & P. R. R., wrecking a train. *Texas*.—Pilot Point, 11th, very heavy rains; all streams overflowed; railroad bridge over Elm Creek carried away; roads almost impassable.

*High Tides*.—New York City, 30th, unusually high tide, causing great damage to property at Rockaway Beach and Coney Island. Little Egg Harbor, N. J., 4th. New London, 1st; 4th, remarkably high; 31st. Bangor, Me., 11th. New Haven, 4th, remarkably high; many of the wharves covered and the meadows of the Quinnipiac valley completely submerged.

*Low Tides*.—New River, N. C., 23rd.

## TEMPERATURE OF WATER.

*The temperature of water*, as observed in rivers and harbors at Signal Service stations, with the average depth at which observations were taken, is given in the table on the left-hand side of chart No. III. Owing to ice and breakage of instruments, observations are wanting as follows: Alpena, Burlington, Vt., Cleveland, Chicago, Duluth, Grand Haven, Milwaukee, Marquette, San Francisco, 1st to 31st; Punta Rasa, 1st to 6th; Augusta, 18th to 22nd; Sandusky, 1st to 19th, 30th, 31st; Detroit, 1st to 17th, 30th, 31st; Buffalo, 1st to 27th; Toledo, 1st to 23rd.

## ATMOSPHERIC ELECTRICITY.

*Thunder-storms*.—In the various districts they were reported on the following dates: New England, 1st, 2nd, 16th, 20th; Middle Atlantic States, 3rd, 4th, 9th, 12th, 13th, 16th, 19th, 20th, 29th, 30th, 31st; South Atlantic States, 3rd, 18th, 19th, 22nd, 25th, 26th, 29th, 30th; Eastern Gulf States, 3rd, 7th to 9th, 11th, 12th, 13th, 16th to 19th, 21st, 25th, 26th, 29th; Western Gulf States, (excluding Texas,) 7th, 10th to 12th, 14th to 19th, 21st, 25th, 28th, 29th; Texas, 6th to 11th, 15th to 18th, 24th, 25th, 28th, 29th; Ohio valley and Tennessee, 2nd, 3rd, 11th, 12th, 16th, 18th, 19th, 25th, 28th, 29th; Upper Mississippi valley, 2nd, 11th, 14th to 16th, 25th; Lower Missouri valley, 1st, 2nd, 9th, 10th, 14th to 16th, 25th; Arkansas and Indian Territory, 6th, 9th, 10th, 11th, 14th, 15th, 18th, 24th; New Mexico and Arizona, 8th, 9th; Nevada, Carson City, 31st; California, Red Bluff, 9th, 20th, Yosemite valley, 31st; Oregon and Washington Territory, along the valley of the Willamette, 1st, 23rd, 26th. No thunder-storms were reported from the Lake region, the Northwest or Rocky Mountain regions.

*Auroras*.—In general there were no unusually brilliant displays reported, but the element of frequency afforded quite prominently their appearance in the Northwest. The most important manifestation of auroral display was shown on the evening of the 18th by a somewhat remarkable continuity of observation extending throughout the Lake region and reaching in an unbroken line from Halifax, N. S., westward to the northwestern extremity of Montana. This line of observation was not a direct one, but assumed the form of an elliptical curve, the point of intersection with its minor axis coinciding very nearly with the geographical position of Chicago. Less extended but not entirely local displays, were witnessed as follows: 2nd, from stations in western Maine, northern New Hampshire, eastern New York, throughout Dakota, in western Montana and in Oregon and Washington Territory. In respect to the display in the two latter States a more extended notice is desirable. At Unatilla the aurora was visible from 8:50 to 10:20 p. m.; at 9 p. m. a small pale yellow light was visible in the N.N.E., increasing steadily in size until it assumed the form of an arch of about 20°, which occurred about 10 p. m.; thereafter until the close, bright luminous beams or flashes of reddish light shot upward toward the zenith, a distance of 35°. At Dayton, from 10 to 11:15 p. m., azimuth 180° to 205°, altitude 20°. 3rd, from Cape Breton Island, eastern New York, northern Minnesota, Dakota and western Montana. 20th, from southern Iowa northward to British America and westward to Dakota. 31st, from northern Iowa northward to British America and westward to Washington Territory. The following were local displays: Sidney, Cape Breton Island, 9th, p. m. Bangor, Me., 8th, a. m. St. Vincent, Minn., 23rd, 8:30 to 9:40 p. m.; 24th, 7 p. m. to midnight; 26th, 9 p. m. to midnight; 30th, 8 to 9:40 p. m. Spiritwood, Dak., 11th, p. m., 30th, p. m.

*Zodiacal Light*.—New Corydon, Ind., 22nd, 23rd; Clinton, Ia., 21st, 22nd, 23rd; Monticello, Ia., 20th, 21st, 22nd; Manhattan, Kan., 7th; Yates Center, Kan., 22nd, 23rd, 25th; Harvard College Observatory, Cambridge, Mass., 21st, 25th, 26th, 28th, slightly visible among clouds on the 24th; Somerset, Mass., 24th, 25th, 26th, 27th; Oregon, Mo., 16th, 17th, 25th, 29th, 30th; Bellefontaine, Ohio, 22nd, 27th, Wytheville, Va., 21st; Havana, Cuba, 17th to 19th, 22nd to 25th, 28th, 29th; Rochester, 10th; Nashville, 24th, 27th; New Haven, 25th.